Appendix E

Cormix Modeling

Background

When DEQ considers authorizing a mixing zone that exceeds 25% of the volume of the receiving water, a mixing zone study may be performed to learn more about the effluent plume. Cormix is the model developed by EPA for the analysis of wastewater discharges. This study was prompted because the draft permit added a first time effluent limit for phosphorus that would require a mixing zone greater than 25%. Three scenarios were modeled; the first two attempt to to depict conditions during June and July using a high phosphorus effluent concentration. Results of these two scenarios prompted a third scenario which uses a lower phosphorus concentration along with a slightly lower flow to capture conditions typical during August and early September. Although not ideal, results of the third scenario impacted beneficial uses the least while allowing the currently permitted amount of phosphorus to be discharged.

Discussion

Three different scenarios were modeled to examine the behavior of the effluent plume discharged from the Sandpoint Wastewater Treatment Plant. The effluent is discharged through a 3 foot diameter pipe laid on the bed of Pend Oreille River. It is positioned perpendicular to the riverbank in the vicinity of Birch Street and S. Ella Avenue in Sandpoint, Idaho. The pipe extends 925 feet into the river and is equipped with a 164 foot multiport diffuser.

Summer months are significant in that phosphorus from this discharge will be utilized by aquatic plants and algae which could adversely affect recreational uses of the river. The summer season is also when low flow conditions can occur and are the most challenging for mixing effluent while meeting provisions of the Idaho Water Quality Standards for mixing zones. Specifically, the WQS under IDAPA 58.01.02.060.01 state:

b. The mixing zone is to be located so it does not cause unreasonable interference with or danger to existing beneficial uses. (7-1-93)

c. When two (2) or more individual mixing zones are needed for a single activity, the sum of the areas and volumes of the several mixing zones is not to exceed the area and volume which would be allowed for a single zone; (7-1-93)

d. Multiple mixing zones can be established for a single discharge, each being specific for one (1) or more pollutants contained within the discharged wastewater; (7-1-93)

e. Mixing zones in flowing receiving waters are to be limited to the following: (7-1-93)

i. The cumulative width of adjacent mixing zones when measured across the receiving water is not to exceed fifty percent (50%) of the total width of the receiving water at that point; (7-1-93)

ii. The width of a mixing zone is not to exceed twenty-five percent (25%) of the stream width or three hundred (300) meters plus the horizontal length of the diffuser as measured perpendicularly to the stream flow, whichever is less; (7-1-93)

iii. The mixing zone is to be no closer to the ten (10) year, seven (7) day low-flow shoreline than fifteen percent (15%) of the stream width; (7-1-93)

iv. The mixing zone is not to include more than twenty-five percent (25%) of the volume of the stream flow; (7-1-93)

f. Mixing zones in reservoirs and lakes are to be limited to the following: (7-1-93)

i. The total horizontal area allocated to mixing zones is not to exceed ten percent (10%) of the surface area of the lake; (7-1-93)
ii. Adjacent mixing zones are to be no closer than the greatest horizontal dimension of any of the individual zones; (7-1-93)
g. The water quality within a mixing zone may exceed chronic water quality criteria so long as chronic water quality criteria are met at the boundary of any approved mixing zone. Acute water quality criteria may be exceeded within a zone of initial dilution inside the mixing zone if approved by the Department. (3-23-98)
h. Concentrations of hazardous materials within the mixing zone must not exceed the ninety-six (96) hour LC50 for biota significant to the receiving water's aquatic community. (7-1-93)

The Pend Oreille River is regulated by the Albani Falls dam operated by the Army Corps of Engineers. A summer pool is maintained after spring runoff until early September when Pend Oreille Lake and the Pend Oreille River above the dam are drawn down for power generation. At the point of discharge the river is approximately 1.8 miles wide but within approximately 1.3 miles narrows considerably. Upstream of the discharge, a mile long earthen jetty extends from the north riverbank carrying US Highway 95 across the river. This jetty creates an opening of approximately 1.1 miles for river passage. The discharge is located in an area protected from the main river flow by the jetty.

The WQS contain a narrative standard for nutrients which includes phosphorus. This narrative standard has been interpreted by EPA to be an in-river target of 10µg/L and the background concentration from Pend Oreille Lake as 7.3µg/L (Fact Sheet Appendix E) along with river flow values that do not represent critical low flows. These numbers could vary such as a river target concentration of 12µg/L, a background concentration of 9µg/L combined with critical low river flow; however, for consistency we used values from the Fact Sheet.

The resulting plume from each of the Cormix model runs is overlain on an aerial photo of the river at the point of discharge (Images 1 and 2). The Cormix Session Report for each of the three runs follows the respective image. The session reports list the specific parameters used for each of the model runs. Site specific information on velocity of the river in the vicinity of the diffuser during various times of the summer was not available so estimates were made based on flow data and other available physical measurements.

Image 1 shows the result of varying the flow of the river from 13,858 to 28,000 cfs and an effluent concentration of phosphorus for both plumes set at 3290µg/L. To put the flow values into context, the average river flow during July (1990-2012) was 26,396 cfs. The phosphorus value of 3290µg/L was selected to examine the scenario of allowing 50% of the river volume at this location to be used for mixing. The corresponding effluent limit with a 50% mixing zone would be 3290µg/L. This additional load of phosphorus would give the WWTP added flexibility. Also in Image 1, the green dot represents the diffuser, and the shaded area, the size of the mixing zone for each modeled condition. Both results indicate that the mixing zone encompasses the full width of the river before phosphorus is diluted down to 10µg/L. The Cormix model is unable to show the plume bending down river as it encounters the main river flow as it comes under the Long Bridge but in reality, the plume bends and heads towards Dover. This is illustrated by the red lines.

Image 2 shows the model result using an average August river flow of 12,171cfs with warmer water both on the bottom and surface. A lower phosphorus effluent limit of 2868µg/L was used which requires 43.5% of the river volume for dilution. This limit approximates the currently discharged amount of phosphorus from the WWTP but does not allow for future increases of phosphorus loading to the river. In Image 2 the effluent plume is shaded in green. In comparison with the previous two scenarios in Image 1, the area of the mixing zone is smaller due to the lower phosphorus concentration. Also, under this scenario due to the lack of temperature stratification from the bottom to the surface of the river and a weak current (typical for August), the plume rises slowly and begins to spread out. The pattern of spread is subject to localized currents from various forces such as shape of the river, wind, rainfall, boat traffic, etc. The black arrows attempt to show where these localized currents might be located due to the shape of the river. The Cormix model cannot predict the exact shape and size of this plume under these conditions. Localized currents would play a lesser role under conditions with a higher velocity main river flow.

In conclusion, each of the three scenarios results in the plume extending for more than 50% of the width of the river, occupying more than 25% of the volume of the river and traveling along the river bank shortly after leaving the diffuser. These characteristics are contrary to WQS mixing zone policy. The area affected by the mixing zone is highly developed recreational properties and urban waterfront. The third scenario reduced these impacts but did not eliminate them.

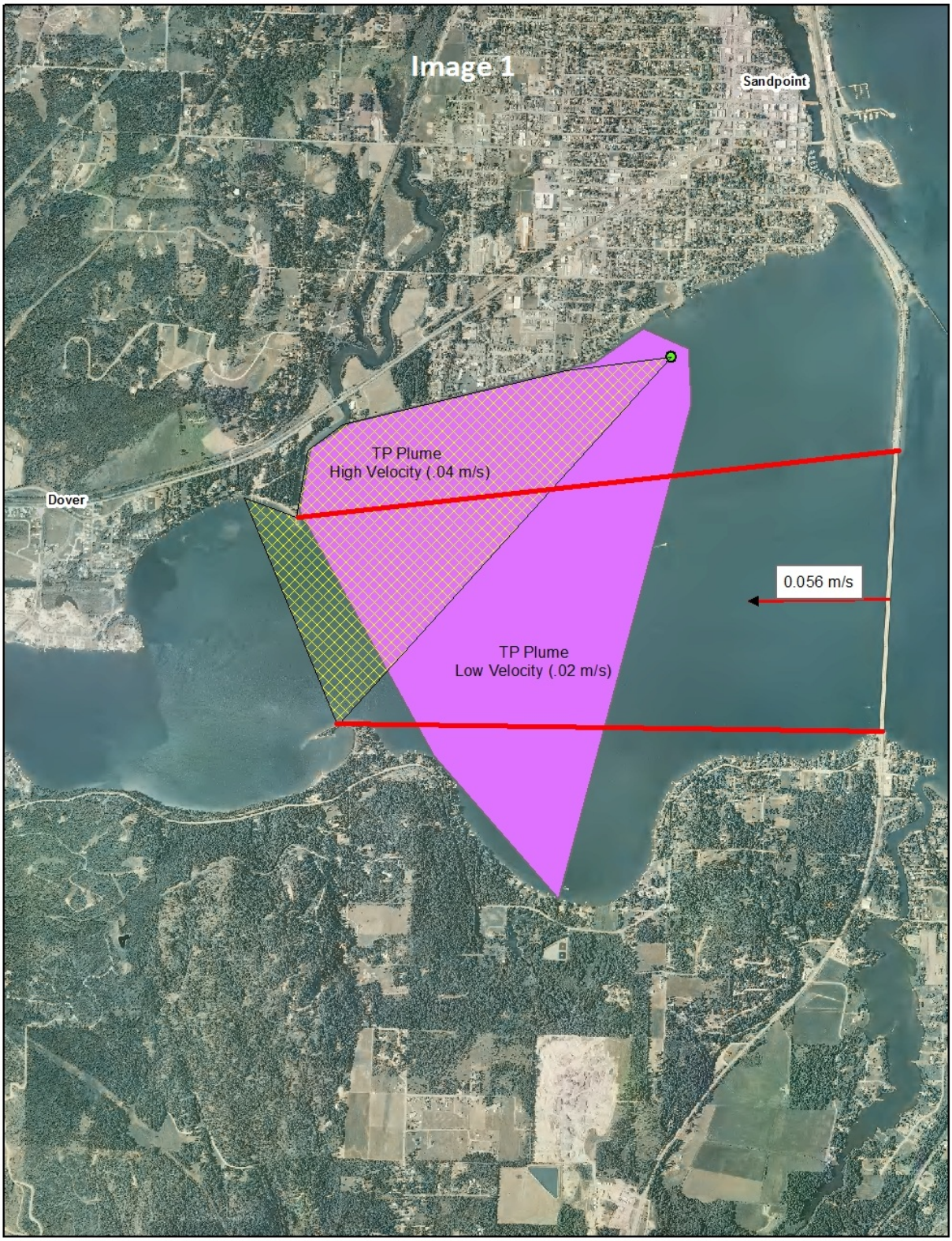
Image 1
Sandpoint
Dover
TP Plume
High Velocity (.04 m/s)
0.056 m/s
TP Plume
Low Velocity (.02 m/s)

Low Velocity High Phosphorus Cormix Session Report

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CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 8.0GTD
                       HYDRO2:Version-8.0.0.0  April,2012
 SITE NAME/LABEL:                Pend Oreille River - Sandpoint outfall
   DESIGN CASE:                  Sandpoint WWTP TP discharge to Pend Oreille River
   FILE NAME:                    C:\data\ALLTECH\WATER\401certs\sandpoint 2013\sandpoint run5.prd
   Using subsystem CORMIX2:     Multiport Diffuser Discharges
   Start of session:             02/01/2013--09:57:01
*******************************************************************************
 SUMMARY OF INPUT DATA:
 -----------------------------------------------------------------------------
 AMBIENT PARAMETERS:
   Cross-section                          = bounded
   Width                         BS       = 2926.08 m
   Channel regularity            ICHREG = 1
   Ambient flowrate              QA       = 239.22 m^3/s
   Average depth                 HA       = 6.71 m
   Depth at discharge            HD       = 5.18 m
   Ambient velocity              UA       = 0.0122 m/s
   Darcy-Weisbach friction factor F       = 0.0167
     Calculated from Manning's n          = 0.02
   Wind velocity                 UW       = 4 m/s
   Stratification Type           STRCND = A
   Surface temperature                    = 24 degC
   Bottom temperature                     = 21 degC
   Calculated FRESH-WATER DENSITY values:
   Surface density               RHOAS  = 997.2973 kg/m^3
   Bottom density                RHOAB  = 997.9934 kg/m^3
 -----------------------------------------------------------------------------
 DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
   Diffuser type                 DITYPE = unidirectional perpendicular
   Diffuser length               LD       = 49.99 m
   Nearest bank                           = right
   Diffuser endpoints            YB1      = 230.73 m;    YB2 = 280.72 m
   Number of openings            NOPEN  = 41
   Number of Risers              NRISER = 41
   Ports/Nozzles per Riser       NPPERR  = 1
   Spacing between risers/openings SPAC   = 1.25 m
   Port/Nozzle diameter          D0       = 0.0762 m
     with contraction ratio               = 1
   Equivalent slot width         B0       = 0.0037 m
   Total area of openings        TA0      = 0.1870 m^2
   Discharge velocity            U0       = 0.85 m/s
   Total discharge flowrate      Q0       = 0.158602 m^3/s
   Discharge port height         H0       = 0.41 m
   Nozzle arrangement            BETYPE = unidirectional without fanning
   Diffuser alignment angle      GAMMA  = 90 deg
   Vertical discharge angle      THETA  = 0 deg
   Actual Vertical discharge angle THEAC  = 0 deg
   Horizontal discharge angle    SIGMA  = 0 deg
   Relative orientation angle    BETA   = 90 deg
   Discharge temperature (freshwater)     = 21 degC
   Corresponding density         RHO0   = 997.9934 kg/m^3
   Density difference            DRHO   = -0.0545 kg/m^3
   Buoyant acceleration          GP0    = -0.0005 m/s^2
   Discharge concentration       C0     = 2.868 mg/l
   Surface heat exchange coeff.  KS     = 0 m/s
   Coefficient of decay          KD     = 0 /s
 -----------------------------------------------------------------------------
 FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
   Discharge (volume flux)       q0     = 0.003173 m^2/s
   Momentum flux                 m0     = 0.002691 m^3/s^2
   Buoyancy flux                 j0     = -0.000002 m^3/s^3
 -----------------------------------------------------------------------------
 DISCHARGE/ENVIRONMENT LENGTH SCALES:
   LQ  = 0.00 m          Lm  = 18.11 m          LM  = 18.85 m
   lm' = 1.27 m          Lb' = 0.33 m           La  = 0.34 m
   (These refer to the actual discharge/environment length scales.)
 -----------------------------------------------------------------------------
 NON-DIMENSIONAL PARAMETERS:
 Slot Froude number              FR0    = 599.54
   Port/nozzle Froude number     FRD0   = 132.83
   Velocity ratio                R      = 69.57
 -----------------------------------------------------------------------------
 MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
   Toxic discharge                        = no
   Water quality standard specified       = yes
   Water quality standard        CSTD     = 0.01 mg/l
   Regulatory mixing zone                 = no
   Region of interest                     = 50000 m downstream
*******************************************************************************
 HYDRODYNAMIC CLASSIFICATION:
   *------------------------*
   | FLOW CLASS    = MS4 |
   *------------------------*
   This flow configuration applies to a layer corresponding to the linearly
   stratified density layer at the discharge site.
   Applicable layer depth = water depth = 5.18 m
*******************************************************************************
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MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

--------------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
    255.73 m from the right bank/shore.
  Number of display steps NSTEP = 20 per module.
--------------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.1396 mg/l
  Dilution at edge of NFR              s = 20.5
  NFR Location:                        x = 107.08 m
    (centerline coordinates)           y = 0 m
                                       z = 0.38 m
  NFR plume dimensions:  half-width (bh) = 206.43 m
                          thickness (bv) = 0.65 m
Cumulative travel time:       8482.125 sec.
--------------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is greater than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is NEGATIVELY BUOYANT and will tend to sink towards
  the bottom.
IMPORTANT NOTE:
Since the effluent is NEGATIVELY BUOYANT, it is STRONGLY recommended that you consider using the Brine or Sediment options for
Effluent specification for a more detailed analysis.

CORMIX will however continue with the current simulation.
--------------------------------------------------------------------------------
Stratification assessment:
  The specified ambient density stratification is dynamically important.
  The discharge near field flow is trapped within the linearly stratified
  ambient density layer.
--------------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  101.44 m
  Intrusion stagnation point              =  -97.58 m
  Intrusion thickness                     =  0.81 m
  Intrusion half width at impingement     =  206.43 m
  Intrusion half thickness at impingement =  0.65 m

  In this case, the UPSTREAM INTRUSION IS VERY LARGE, exceeding ten (10)
    times the local water depth.
  This may be caused by the small ambient velocity, perhaps in combination
    with the strong buoyancy of the effluent, or alternatively, a strong
    ambient stratification.
  If the ambient conditions are quite unsteady (e.g. tidal), then the
    CORMIX steady-state predictions of the upstream intrusion are probably
    unrealistic.  The plume predictions in the immediate near-field, prior
    to the intrusion layer formation, are acceptable, however.
--------------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Plume becomes laterally fully mixed at 1903.43 m downstream.
--------------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in bounded section contacts nearest bank at 149.25 m downstream.
  Plume contacts second bank at 1903.43 m downstream.
********************** TOXIC DILUTION ZONE SUMMARY **********************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
No RMZ has been specified.
However:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                = 0.01  mg/l
  Corresponding dilution              s = 286.8
  Plume location:                     x = 1776.60 m
    (centerline coordinates)          y = -255.73 m
                                      z = 0.38 m
  Plume dimensions:      half-width (bh) = 2742.25 m
                          thickness (bv) = 1.36 m
********************** FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
--------------------------------------------------------------------------------
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REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX2: Multiport Diffuser Discharges
                          CORMIX Version 8.0GTD
                    HYDRO2 Version 8.0.0.0 April 2012
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Pend Oreille River - Sandpoint outfall
 Design case:       Sandpoint WWTP TP discharge to Pend Oreille River
 FILE NAME:         C:\...\WATER\401certs\sandpoint 2013\sandpoint run5.prd
 Time stamp:        Fri Feb  1 09:57:01 2013

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   2926.08  AS    =  19621.12  QA    =    239.22  ICHREG= 1
 HA    =      6.71  HD    =      5.18
 UA    =     0.012  F     =     0.017 USTAR =0.5562E-03
 UW    =     4.000 UWSTAR=0.4609E-02
 Density stratified environment
 STRCND=  A         RHOAM =  997.6454
 RHOAS =  997.2973  RHOAB =  997.9934  RHOAH0=  997.9390  E     =0.1320E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional_perpendicular
 BANK  =  RIGHT     DISTB =    255.73  YB1   =    230.73  YB2   =    280.72
 LD    =    49.99  NOPEN =   41       SPAC  =      1.25
 D0    =    0.076 A0    =     0.005 H0    =      0.41  SUB0  =      4.78
 D0INP =    0.076 CR0   =     1.000
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =    0.848 Q0    =     0.159       =0.1586E+00
 RHO0  =  997.9934  DRHO0 =-.5444E-01  GP0   =-.5350E-03
 C0    =0.2868E+01  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3173E-02  m0    =0.2691E-02  j0    =-.1698E-05  SIGNJ0=     -1.0
 Associated 2-d length scales (meters)
 lQ=B  =     0.004 lM    =     18.85  lm    =     18.11
 lmp   =      1.27 lbp   =      0.33  la    =      0.34

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1586E+00  M0    =0.1345E+00  J0    =-.8485E-04
 Associated 3-d length scales (meters)
 LQ    =      0.07  LM    =     24.11  Lm    =     30.08  Lb    =     46.84
                                       Lmp   =      3.18  Lbp   =      1.15

NON-DIMENSIONAL PARAMETERS
 FR0   =    599.54  FRD0  =    132.83  R     =     69.57  PL    =  140.00
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR RISER GROUPS:
 Properties of riser group with  1 ports/nozzles each:
 U0    =     0.848 D0    =     0.076 A0    =     0.005 THETA =      0.00
 FR0   =    599.54  FRD0  =    132.83  R     =     69.57
 (slot)             (riser group)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MS4    2
 2  Applicable layer depth HS =     5.18  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.2868E+01  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1000E-01
 REGMZ =  0
 XINT  =  50000.00  XMAX  =  50000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       255.73 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  20 display intervals per module
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y        Z        S        C        BV       BH       Uc        TT
     0.00     0.00     0.41      1.0 0.287E+01    0.04     0.04     0.836   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
------------------------------------------------------------------------------------------------
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BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet-like motion in linear stratification with weak crossflow.
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 Zone of flow establishment:              THETAE=      0.00  SIGMAE=      0.00
  LE    =       0.38  XE    =       0.38  YE    =       0.00  ZE    =       0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X         Y         Z         S         C         BV        BH        Uc        TT
 Individual jet/plumes before merging:
      0.38      0.00      0.41      1.0 0.287E+01    0.04      0.04      0.836   .00000E+00
      0.38      0.00      0.41      1.0 0.287E+01    0.04      0.04      0.836   .31834E-02
 Maximum jet height has been reached.
      0.55      0.00      0.41      1.3 0.227E+01    0.06      0.06      0.782   .18551E+00
      0.73      0.00      0.41      1.7 0.170E+01    0.08      0.08      0.586   .44387E+00
      0.90      0.00      0.41      2.1 0.136E+01    0.09      0.09      0.471   .76657E+00
      1.08      0.00      0.40      2.5 0.113E+01    0.11      0.11      0.392   .11669E+01
      1.25      0.00      0.40      3.0 0.967E+00    0.13      0.13      0.336   .16379E+01
      1.42      0.00      0.40      3.4 0.846E+00    0.15      0.15      0.294   .21667E+01
      1.60      0.00      0.40      3.8 0.750E+00    0.17      0.17      0.261   .27755E+01
      1.77      0.00      0.40      4.2 0.675E+00    0.18      0.18      0.236   .34378E+01
      1.95      0.00      0.40      4.7 0.612E+00    0.20      0.20      0.214   .41818E+01
      2.12      0.00      0.40      5.1 0.560E+00    0.22      0.22      0.196   .49931E+01
      2.30      0.00      0.40      5.6 0.516E+00    0.23      0.23      0.181   .58518E+01
      2.47      0.00      0.40      6.0 0.478E+00    0.25      0.25      0.168   .67945E+01
      2.64      0.00      0.40      6.4 0.446E+00    0.27      0.27      0.157   .77806E+01
      2.82      0.00      0.40      6.9 0.417E+00    0.28      0.28      0.147   .88524E+01
      3.00      0.00      0.39      7.3 0.392E+00    0.30      0.30      0.138   .99885E+01
      3.17      0.00      0.39      7.8 0.370E+00    0.32      0.32      0.131   .11162E+02
      3.34      0.00      0.39      8.2 0.349E+00    0.33      0.33      0.124   .12424E+02
      3.52      0.00      0.39      8.7 0.332E+00    0.35      0.35      0.118   .13720E+02
      3.69      0.00      0.38      9.1 0.315E+00    0.37      0.37      0.112   .15105E+02
      3.87      0.00      0.38      9.5 0.300E+00    0.38      0.38      0.107   .16521E+02
 Cumulative travel time =          16.5209 sec  (     0.00 hrs)
  Merging of individual jet/plumes not found in this module, but interaction
    will occur in following module.  Overall jet/plume interaction dimensions:
      3.87      0.00      0.38      9.5 0.300E+00    0.38     25.03      0.107   .16521E+02

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
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------------------------------------------------------------------------------------------
BEGIN MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING

 UPSTREAM INTRUSION PROPERTIES:
        Maximum elevation of jet/plume rise     =      3.08 m
        Layer thickness in impingement region   =      0.81 m
        Upstream intrusion length               =    101.44 m
        X-position of upstream stagnation point =    -97.58 m
        Thickness in intrusion region           =      0.81 m
        Half-width at downstream end            =    206.43 m
        Thickness at downstream end             =      0.65 m

 In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
   the local water depth.
 This may be caused by a very small ambient velocity, perhaps in
   combination with large discharge buoyancy.
 If the ambient conditions are strongly transient (e.g. tidal), then the
   CORMIX steady-state predictions of upstream intrusion are probably
   unrealistic.
 The plume predictions prior to boundary impingement and wedge formation
   will be acceptable, however.

  Control volume inflow:
       X         Y         Z         S         C         BV        BH        TT
     3.87      0.00      0.38      9.5 0.300E+00    0.38     25.03   .16521E+02

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)
   TT = Cumulative travel time

       X         Y         Z         S         C         BV        BH        ZU        ZL        TT
    -97.58      0.00      0.38 9999.9 0.000E+00    0.00      0.00      0.38      0.38   .84821E+04
    -93.48      0.00      0.38      37.9 0.756E-01    0.20     29.19      0.48      0.28   .16521E+02
    -73.43      0.00      0.38      15.8 0.182E+00    0.49     70.91      0.63      0.14   .16521E+02
    -53.37      0.00      0.38      12.0 0.239E+00    0.64     95.94      0.70      0.06   .16521E+02
    -33.31      0.00      0.38      10.4 0.275E+00    0.74    115.67      0.75      0.01   .16521E+02
    -13.26      0.00      0.38       9.7 0.295E+00    0.79    132.50      0.79      0.00   .16521E+02
      6.80      0.00      0.38       9.6 0.299E+00    0.80    188.96      0.80      0.00   .25698E+03
     26.85      0.00      0.38      11.5 0.249E+00    0.78    192.97      0.78      0.00   .19020E+04
     46.91      0.00      0.38      15.1 0.190E+00    0.73    196.66      0.74      0.02   .35470E+04
```

66.97	0.00	0.38	18.1	0.159E+00	0.68	200.11	0.72	0.04	.51921E+04
87.02	0.00	0.38	19.7	0.145E+00	0.66	203.35	0.71	0.05	.68371E+04
107.08	0.00	0.38	20.5	0.140E+00	0.65	206.43	0.71	0.06	.84821E+04

Cumulative travel time = 8482.1250 sec (2.36 hrs)

END OF MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = top-hat half-width, measured horizontally in y-direction
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic average (bulk) dilution
- C = average (bulk) concentration (includes reaction effects, if any)
- TT = Cumulative travel time

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
107.08	0.00	0.38	20.5	0.140E+00	0.65	206.43	0.71	0.06	.84821E+04
109.19	0.00	0.38	20.8	0.138E+00	0.65	208.87	0.71	0.06	.86549E+04
111.30	0.00	0.38	21.1	0.136E+00	0.65	211.32	0.71	0.06	.88278E+04
113.40	0.00	0.38	21.4	0.134E+00	0.65	213.77	0.71	0.06	.90006E+04
115.51	0.00	0.38	21.7	0.132E+00	0.65	216.22	0.71	0.06	.91734E+04
117.62	0.00	0.38	22.0	0.130E+00	0.65	218.68	0.71	0.05	.93462E+04
119.73	0.00	0.38	22.3	0.129E+00	0.66	221.13	0.71	0.05	.95190E+04
121.84	0.00	0.38	22.6	0.127E+00	0.66	223.59	0.71	0.05	.96918E+04
123.95	0.00	0.38	22.9	0.125E+00	0.66	226.05	0.71	0.05	.98646E+04
126.05	0.00	0.38	23.2	0.124E+00	0.66	228.51	0.71	0.05	.10037E+05
128.16	0.00	0.38	23.5	0.122E+00	0.66	230.97	0.71	0.05	.10210E+05
130.27	0.00	0.38	23.8	0.120E+00	0.66	233.43	0.71	0.05	.10383E+05
132.38	0.00	0.38	24.1	0.119E+00	0.66	235.90	0.71	0.05	.10556E+05
134.49	0.00	0.38	24.4	0.117E+00	0.67	238.37	0.71	0.05	.10729E+05
136.60	0.00	0.38	24.7	0.116E+00	0.67	240.84	0.72	0.05	.10902E+05
138.70	0.00	0.38	25.0	0.115E+00	0.67	243.31	0.72	0.05	.11074E+05
140.81	0.00	0.38	25.4	0.113E+00	0.67	245.78	0.72	0.05	.11247E+05
142.92	0.00	0.38	25.7	0.112E+00	0.67	248.26	0.72	0.05	.11420E+05
145.03	0.00	0.38	26.0	0.110E+00	0.67	250.74	0.72	0.04	.11593E+05
147.14	0.00	0.38	26.3	0.109E+00	0.68	253.22	0.72	0.04	.11766E+05
149.25	0.00	0.38	26.6	0.108E+00	0.68	255.70	0.72	0.04	.11938E+05

Cumulative travel time = 11938.3955 sec (3.32 hrs)

Plume is ATTACHED to RIGHT bank/shore.
Plume width is now determined from RIGHT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
149.25	-255.73	0.38	26.6	0.108E+00	0.68	511.45	0.72	0.04	.11938E+05
236.96	-255.73	0.38	37.6	0.763E-01	0.80	608.60	0.80	0.00	.19128E+05
324.66	-255.73	0.38	48.2	0.595E-01	0.88	716.42	0.88	0.00	.26317E+05
412.37	-255.73	0.38	59.2	0.484E-01	0.93	829.36	0.93	0.00	.33506E+05
500.08	-255.73	0.38	70.7	0.406E-01	0.97	945.29	0.97	0.00	.40695E+05
587.79	-255.73	0.38	82.7	0.347E-01	1.01	1063.22	1.01	0.00	.47885E+05
675.50	-255.73	0.38	95.2	0.301E-01	1.05	1182.62	1.05	0.00	.55074E+05
763.21	-255.73	0.38	108.1	0.265E-01	1.08	1303.18	1.08	0.00	.62263E+05
850.92	-255.73	0.38	121.5	0.236E-01	1.11	1424.70	1.11	0.00	.69452E+05
938.63	-255.73	0.38	135.4	0.212E-01	1.14	1547.02	1.14	0.00	.76641E+05
1026.34	-255.73	0.38	149.7	0.192E-01	1.17	1670.05	1.17	0.00	.83831E+05
1114.05	-255.73	0.38	164.4	0.174E-01	1.19	1793.69	1.19	0.00	.91020E+05
1201.76	-255.73	0.38	179.4	0.160E-01	1.22	1917.88	1.22	0.00	.98209E+05
1289.47	-255.73	0.38	194.9	0.147E-01	1.24	2042.56	1.24	0.00	.10540E+06
1377.18	-255.73	0.38	210.7	0.136E-01	1.26	2167.69	1.26	0.00	.11259E+06
1464.88	-255.73	0.38	226.8	0.126E-01	1.29	2293.23	1.29	0.00	.11978E+06
1552.59	-255.73	0.38	243.3	0.118E-01	1.31	2419.15	1.31	0.00	.12697E+06
1640.30	-255.73	0.38	260.1	0.110E-01	1.33	2545.41	1.33	0.00	.13416E+06
1728.01	-255.73	0.38	277.2	0.103E-01	1.35	2671.99	1.35	0.00	.14134E+06

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard or CCC value of 0.100E-01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

1815.72	-255.73	0.38	294.6	0.973E-02	1.37	2798.88	1.37	0.00	.14853E+06
1903.43	-255.73	0.38	312.3	0.918E-02	1.39	2926.03	1.39	0.00	.15572E+06

Cumulative travel time = 155722.9688 sec (43.26 hrs)
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

Due to the attachment or proximity of the plume to the bottom, the bottom coordinate for the FAR-FIELD differs from the ambient depth, ZFB = 0 m.
In a subsequent analysis set "depth at discharge" equal to "ambient depth".

BEGIN MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

Vertical diffusivity (initial value) = 0.834E-07 m^2/s
Horizontal diffusivity (initial value) = 0.598E-02 m^2/s

Profile definitions:
  BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
     = or equal to layer depth, if fully mixed
  BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
       measured horizontally in Y-direction
  ZU = upper plume boundary (Z-coordinate)
  ZL = lower plume boundary (Z-coordinate)
  S = hydrodynamic centerline dilution
  C = centerline concentration (includes reaction effects, if any)
  TT = Cumulative travel time

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
1903.43	-255.73	0.38	312.3	0.918E-02	1.39	2926.03	1.39	0.00	.15572E+06
4308.26	-255.73	0.38	316.5	0.906E-02	1.41	2926.03	1.41	0.00	.35284E+06
6713.09	-255.73	0.38	320.6	0.895E-02	1.43	2926.03	1.43	0.00	.54995E+06
9117.92	-255.73	0.38	324.6	0.883E-02	1.44	2926.03	1.44	0.00	.74707E+06
11522.74	-255.73	0.38	328.6	0.873E-02	1.46	2926.03	1.46	0.00	.94419E+06
13927.57	-255.73	0.38	332.6	0.862E-02	1.48	2926.03	1.48	0.00	.11413E+07
16332.40	-255.73	0.38	336.5	0.852E-02	1.50	2926.03	1.50	0.00	.13384E+07
18737.23	-255.73	0.38	340.4	0.843E-02	1.51	2926.03	1.51	0.00	.15355E+07
21142.06	-255.73	0.38	344.2	0.833E-02	1.53	2926.03	1.53	0.00	.17326E+07
23546.88	-255.73	0.38	348.0	0.824E-02	1.55	2926.03	1.55	0.00	.19298E+07
25951.71	-255.73	0.38	351.7	0.816E-02	1.56	2926.03	1.56	0.00	.21269E+07
28356.54	-255.73	0.38	355.4	0.807E-02	1.58	2926.03	1.58	0.00	.23240E+07
30761.37	-255.73	0.38	359.0	0.799E-02	1.60	2926.03	1.60	0.00	.25211E+07
33166.20	-255.73	0.38	362.7	0.791E-02	1.61	2926.03	1.61	0.00	.27182E+07
35571.03	-255.73	0.38	366.2	0.783E-02	1.63	2926.03	1.63	0.00	.29153E+07
37975.86	-255.73	0.38	369.8	0.776E-02	1.64	2926.03	1.64	0.00	.31125E+07
40380.68	-255.73	0.38	373.3	0.768E-02	1.66	2926.03	1.66	0.00	.33096E+07
42785.51	-255.73	0.38	376.8	0.761E-02	1.68	2926.03	1.68	0.00	.35067E+07
45190.34	-255.73	0.38	380.2	0.754E-02	1.69	2926.03	1.69	0.00	.37038E+07
47595.17	-255.73	0.38	383.7	0.748E-02	1.71	2926.03	1.71	0.00	.39009E+07
50000.00	-255.73	0.38	387.1	0.741E-02	1.72	2926.03	1.72	0.00	.40980E+07

Cumulative travel time = 4098038.0000 sec (1138.34 hrs)

Simulation limit based on maximum specified distance = 50000.00 m.
  This is the REGION OF INTEREST limitation.

END OF MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

CORMIX2: Multiport Diffuser Discharges End of Prediction File

2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222

High Velocity, High Phosphorus Cormix Session Report

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                         CORMIX Version 8.0GTD
                       HYDRO2:Version-8.0.0.0  April,2012
 SITE NAME/LABEL:                Pend Oreille River - Sandpoint outfall
   DESIGN CASE:                  Sandpoint WWTP TP discharge to Pend Oreille River
   FILE NAME:                    C:\data\ALLTECH\WATER\401certs\sandpoint 2013\sandpoint run3.prd
   Using subsystem CORMIX2:     Multiport Diffuser Discharges
   Start of session:             02/07/2013--10:49:37
 ********************************************************************************
 SUMMARY OF INPUT DATA:
 --------------------------------------------------------------------------------
 AMBIENT PARAMETERS:
   Cross-section                          = bounded
   Width                          BS      = 2926.08 m
   Channel regularity             ICHREG  = 1
   Ambient flowrate               QA      = 792.87 m^3/s
   Average depth                  HA      = 6.71 m
   Depth at discharge             HD      = 5.18 m
   Ambient velocity               UA      = 0.0404 m/s
   Darcy-Weisbach friction factor F       = 0.0167
     Calculated from Manning's n          = 0.02
   Wind velocity                  UW      = 4 m/s
   Stratification Type            STRCND  = A
   Surface temperature                    = 24 degC
   Bottom temperature                     = 16 degC
   Calculated FRESH-WATER DENSITY values:
   Surface density                RHOAS   = 997.2973 kg/m^3
   Bottom density                 RHOAB   = 998.9443 kg/m^3
 --------------------------------------------------------------------------------
 DISCHARGE PARAMETERS:             Submerged Multiport Diffuser Discharge
   Diffuser type                  DITYPE  = unidirectional perpendicular
   Diffuser length                LD      = 49.99 m
   Nearest bank                           = right
   Diffuser endpoints             YB1     = 230.73 m;    YB2 = 280.72 m
   Number of openings             NOPEN   = 41
   Number of Risers               NRISER  = 41
   Ports/Nozzles per Riser        NPPERR  = 1
   Spacing between risers/openings SPAC   = 1.25 m
   Port/Nozzle diameter           D0      = 0.0762 m
     with contraction ratio               = 1
   Equivalent slot width          B0      = 0.0037 m
   Total area of openings         TA0     = 0.1870 m^2
   Discharge velocity             U0      = 0.85 m/s
   Total discharge flowrate       Q0      = 0.158602 m^3/s
   Discharge port height          H0      = 0.41 m
   Nozzle arrangement             BETYPE  = unidirectional without fanning
   Diffuser alignment angle       GAMMA   = 90 deg
   Vertical discharge angle       THETA   = 0 deg
   Actual Vertical discharge angle THEAC  = 0 deg
   Horizontal discharge angle     SIGMA   = 0 deg
   Relative orientation angle     BETA    = 90 deg
   Discharge temperature (freshwater)     = 20 degC
   Corresponding density          RHO0    = 998.2051 kg/m^3
   Density difference             DRHO    = 0.6104 kg/m^3
   Buoyant acceleration           GP0     = 0.006 m/s^2
   Discharge concentration        C0      = 3.29 mg/l
   Surface heat exchange coeff.   KS      = 0 m/s
   Coefficient of decay           KD      = 0 /s
 --------------------------------------------------------------------------------
 FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
   Discharge (volume flux)        q0      = 0.003173 m^2/s
   Momentum flux                  m0      = 0.002691 m^3/s^2
   Buoyancy flux                  j0      = 0.000019 m^3/s^3
 --------------------------------------------------------------------------------
 DISCHARGE/ENVIRONMENT LENGTH SCALES:
   LQ  = 0.00 m          Lm  = 1.65 m          LM  = 3.77 m
   lm' = 0.95 m          Lb' = 0.48 m          La  = 0.72 m
   (These refer to the actual discharge/environment length scales.)
 --------------------------------------------------------------------------------
 NON-DIMENSIONAL PARAMETERS:
 Slot Froude number              FR0     = 179.16
   Port/nozzle Froude number     FRD0    = 39.69
   Velocity ratio                R       = 20.99
 --------------------------------------------------------------------------------
 MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
   Toxic discharge                        = no
   Water quality standard specified       = yes
   Water quality standard         CSTD    = 0.01 mg/l
   Regulatory mixing zone                 = no
   Region of interest                     = 30000 m downstream
 ********************************************************************************
 HYDRODYNAMIC CLASSIFICATION:
   *------------------------*
   | FLOW CLASS   = MS4 |
   *------------------------*
   This flow configuration applies to a layer corresponding to the linearly
   stratified density layer at the discharge site.
   Applicable layer depth = water depth = 5.18 m
 ********************************************************************************
```

```
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

--------------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
    255.73 m from the right bank/shore.
  Number of display steps NSTEP = 20 per module.
--------------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0809 mg/l
  Dilution at edge of NFR              s = 40.7
  NFR Location:                        x = 55.48 m
    (centerline coordinates)           y = 0 m
                                       z = 0.51 m
  NFR plume dimensions:  half-width (bh) = 89.71 m
                         thickness (bv) = 0.89 m
Cumulative travel time:       1194.4045 sec.
--------------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
--------------------------------------------------------------------------------
Stratification assessment:
  The specified ambient density stratification is dynamically important.
  The discharge near field flow is trapped within the linearly stratified
  ambient density layer.
--------------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                          =  44.60 m
  Intrusion stagnation point                =  -33.98 m
  Intrusion thickness                       =  1.74 m
  Intrusion half width at impingement       =  89.71 m
  Intrusion half thickness at impingement =  0.89 m
--------------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Plume becomes laterally fully mixed at 5904.29 m downstream.
--------------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in bounded section contacts nearest bank at 373.64 m downstream.
  Plume contacts second bank at 5904.29 m downstream.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
No RMZ has been specified.
However:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                  = 0.01  mg/l
  Corresponding dilution                s = 329.2
  Plume location:                       x = 2763.00 m
    (centerline coordinates)            y = -255.73 m
                                        z = 0.51 m
  Plume dimensions:       half-width (bh) = 1515.51 m
                           thickness (bv) = 0.85 m
******************** FINAL DESIGN ADVICE AND COMMENTS ***********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
--------------------------------------------------------------------------------
REMINDER:  The user must take note that HYDRODYNAMIC MODELING by any known
  technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the
  CORMIX predictions on dilutions and concentrations (with associated
  plume geometries) are reliable for the majority of cases and are accurate
  to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges
  the design configuration as highly complex and uncertain for prediction.
```

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX2: Multiport Diffuser Discharges
                         CORMIX Version 8.0GTD
                    HYDRO2 Version 8.0.0.0 April 2012
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Pend Oreille River - Sandpoint outfall
 Design case:       Sandpoint WWTP TP discharge to Pend Oreille River
 FILE NAME:         C:\...\WATER\401certs\sandpoint 2013\sandpoint run3.prd
 Time stamp:        Thu Feb  7 10:49:37 2013

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   2926.08  AS    =  19621.12  QA    =    792.87  ICHREG= 1
 HA    =      6.71  HD    =      5.18
 UA    =     0.040  F     =     0.017 USTAR =0.1844E-02
 UW    =     4.000 UWSTAR=0.4609E-02
 Density stratified environment
 STRCND=  A         RHOAM =  998.1208
 RHOAS =  997.2973  RHOAB =  998.9443  RHOAH0=  998.8155  E     =0.3120E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional_perpendicular
 BANK  =  RIGHT     DISTB =    255.73  YB1   =    230.73  YB2   =    280.72
 LD    =    49.99  NOPEN =   41       SPAC  =      1.25
 D0    =    0.076  A0    =     0.005 H0    =      0.41  SUB0  =      4.78
 D0INP =    0.076  CR0   =     1.000
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =    0.848  Q0    =     0.159       =0.1586E+00
 RHO0  =  998.2051  DRHO0 =0.6104E+00  GP0   =0.5993E-02
 C0    =0.3290E+01  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3173E-02  m0    =0.2691E-02  j0    =0.1902E-04  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =     0.004 lM    =      3.77  lm    =      1.65
 lmp   =      0.95  lbp   =      0.48  la    =      0.72

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1586E+00  M0    =0.1345E+00  J0    =0.9505E-03
 Associated 3-d length scales (meters)
 LQ    =      0.07  LM    =      7.21  Lm    =      9.08  Lb    =     14.40
                                       Lmp   =      2.56  Lbp   =      1.53

NON-DIMENSIONAL PARAMETERS
 FR0   =    179.16  FRD0  =     39.69  R     =     20.99  PL    =   13.93
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR RISER GROUPS:
 Properties of riser group with  1 ports/nozzles each:
 U0    =     0.848 D0    =     0.076 A0    =     0.005 THETA =      0.00
 FR0   =    179.16  FRD0  =     39.69  R     =     20.99
 (slot)             (riser group)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MS4    2
 2  Applicable layer depth HS =     5.18  2
 22222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3290E+01  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1000E-01
 REGMZ =  0
 XINT  =  30000.00  XMAX  =  30000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       255.73 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  20 display intervals per module
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

      X        Y        Z        S        C        BV       BH       Uc        TT
    0.00     0.00     0.41     1.0 0.329E+01    0.04     0.04     0.808   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet-like motion in linear stratification with weak crossflow.
```

```
 Zone of flow establishment:              THETAE=      0.00  SIGMAE=      0.00
  LE    =      0.38  XE    =      0.38  YE    =      0.00  ZE    =      0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

      X        Y        Z        S        C        BV       BH       Uc        TT
 Individual jet/plumes before merging:
     0.38     0.00     0.41     1.0 0.329E+01   0.04     0.04     0.808   .00000E+00
     0.38     0.00     0.41     1.0 0.329E+01   0.04     0.04     0.808   .32592E-02
     0.89     0.00     0.41     2.1 0.157E+01   0.09     0.09     0.460   .73930E+00
     1.40     0.00     0.42     3.4 0.971E+00   0.14     0.14     0.289   .20345E+01
     1.91     0.00     0.43     4.7 0.698E+00   0.18     0.18     0.210   .38397E+01
     2.43     0.00     0.43     6.1 0.543E+00   0.22     0.22     0.165   .61110E+01
     2.94     0.00     0.44     7.4 0.444E+00   0.26     0.26     0.136   .88087E+01
     3.45     0.00     0.45     8.8 0.375E+00   0.29     0.29     0.116   .11898E+02
     3.96     0.00     0.46    10.2 0.324E+00   0.33     0.33     0.101   .15346E+02
     4.48     0.00     0.46    11.5 0.285E+00   0.36     0.36     0.090   .19127E+02
     4.99     0.00     0.47    12.9 0.255E+00   0.39     0.39     0.081   .23215E+02
     5.50     0.00     0.48    14.3 0.231E+00   0.42     0.42     0.073   .27588E+02
     6.01     0.00     0.48    15.6 0.210E+00   0.44     0.44     0.067   .32225E+02
     6.53     0.00     0.49    17.0 0.194E+00   0.47     0.47     0.062   .37107E+02
     7.04     0.00     0.49    18.3 0.179E+00   0.49     0.49     0.058   .42219E+02
     7.55     0.00     0.50    19.7 0.167E+00   0.52     0.52     0.054   .47545E+02
     8.06     0.00     0.50    21.0 0.157E+00   0.54     0.54     0.051   .53071E+02
     8.58     0.00     0.50    22.3 0.147E+00   0.56     0.56     0.048   .58786E+02
     9.09     0.00     0.51    23.6 0.139E+00   0.59     0.59     0.045   .64677E+02
     9.60     0.00     0.51    24.9 0.132E+00   0.61     0.61     0.043   .70734E+02
 Merging of individual jet/plumes to form plane jet/plume:
    10.11     0.00     0.51    32.3 0.102E+00   0.78    25.78     0.029   .76863E+02
    10.62     0.00     0.51    33.0 0.998E-01   0.81    25.80     0.028   .84323E+02
 Terminal level in stratified ambient has been reached.
 Cumulative travel time =          84.3234 sec  (    0.02 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------
BEGIN MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING

 UPSTREAM INTRUSION PROPERTIES:
        Maximum elevation of jet/plume rise     =      2.69 m
        Layer thickness in impingement region   =      1.74 m
        Upstream intrusion length               =     44.60 m
        X-position of upstream stagnation point =    -33.98 m
        Thickness in intrusion region           =      1.74 m
        Half-width at downstream end            =     89.71 m
        Thickness at downstream end             =      0.89 m

  Control volume inflow:
      X        Y        Z        S        C        BV       BH        TT
    10.62     0.00     0.51    33.0 0.998E-01   0.81    25.80    .84323E+02

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)
   TT = Cumulative travel time

      X        Y        Z        S        C        BV       BH       ZU       ZL        TT
    -33.98     0.00     0.51  9999.9 0.000E+00   0.00     0.00     0.51     0.51   .11944E+04
    -32.19     0.00     0.51   131.4 0.250E-01   0.44    12.69     0.73     0.30   .84323E+02
    -23.43     0.00     0.51    54.7 0.601E-01   1.05    30.82     1.05     0.00   .84323E+02
    -14.66     0.00     0.51    41.6 0.792E-01   1.38    41.70     1.38     0.00   .84323E+02
     -5.89     0.00     0.51    36.1 0.912E-01   1.59    50.27     1.59     0.00   .84323E+02
      2.88     0.00     0.51    33.6 0.979E-01   1.70    57.59     1.70     0.00   .84323E+02
     11.64     0.00     0.51    33.0 0.997E-01   1.73    82.18     1.73     0.00   .10960E+03
     20.41     0.00     0.51    34.3 0.959E-01   1.59    83.91     1.59     0.00   .32656E+03
     29.18     0.00     0.51    36.8 0.894E-01   1.32    85.50     1.32     0.00   .54352E+03
     37.94     0.00     0.51    38.9 0.845E-01   1.08    86.99     1.08     0.00   .76048E+03
     46.71     0.00     0.51    40.1 0.820E-01   0.95    88.39     0.99     0.04   .97744E+03
     55.48     0.00     0.51    40.7 0.809E-01   0.89    89.71     0.96     0.07   .11944E+04
 Cumulative travel time =        1194.4047 sec  (    0.33 hrs)

END OF MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING
------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **
------------------------------------------------------------------------------------------
BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

 Profile definitions:
```

BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)
TT = Cumulative travel time

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
55.48	0.00	0.51	40.7	0.809E-01	0.89	89.71	0.96	0.07	.11944E+04
71.39	0.00	0.51	42.3	0.778E-01	0.81	102.46	0.92	0.11	.15880E+04
87.29	0.00	0.51	43.8	0.752E-01	0.75	113.98	0.89	0.14	.19816E+04
103.20	0.00	0.51	45.1	0.729E-01	0.71	124.61	0.87	0.16	.23752E+04
119.11	0.00	0.51	46.5	0.708E-01	0.68	134.53	0.85	0.17	.27688E+04
135.02	0.00	0.51	47.8	0.689E-01	0.65	143.90	0.84	0.19	.31624E+04
150.93	0.00	0.51	49.1	0.670E-01	0.63	152.81	0.83	0.20	.35560E+04
166.83	0.00	0.51	50.4	0.653E-01	0.61	161.35	0.82	0.21	.39496E+04
182.74	0.00	0.51	51.8	0.636E-01	0.60	169.58	0.81	0.21	.43432E+04
198.65	0.00	0.51	53.1	0.619E-01	0.59	177.55	0.81	0.22	.47368E+04
214.56	0.00	0.51	54.6	0.603E-01	0.58	185.29	0.80	0.22	.51303E+04
230.47	0.00	0.51	56.0	0.587E-01	0.57	192.85	0.80	0.23	.55239E+04
246.37	0.00	0.51	57.5	0.572E-01	0.56	200.24	0.80	0.23	.59175E+04
262.28	0.00	0.51	59.1	0.557E-01	0.56	207.50	0.79	0.23	.63111E+04
278.19	0.00	0.51	60.6	0.542E-01	0.55	214.64	0.79	0.24	.67047E+04
294.10	0.00	0.51	62.3	0.528E-01	0.55	221.68	0.79	0.24	.70983E+04
310.01	0.00	0.51	63.9	0.515E-01	0.55	228.63	0.79	0.24	.74919E+04
325.91	0.00	0.51	65.6	0.501E-01	0.55	235.50	0.79	0.24	.78855E+04
341.82	0.00	0.51	67.3	0.488E-01	0.55	242.30	0.79	0.24	.82791E+04
357.73	0.00	0.51	69.1	0.476E-01	0.54	249.05	0.79	0.24	.86727E+04
373.64	0.00	0.51	70.9	0.464E-01	0.54	255.75	0.79	0.24	.90663E+04

Cumulative travel time = 9066.2852 sec (2.52 hrs)

Plume is ATTACHED to RIGHT bank/shore.
Plume width is now determined from RIGHT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
373.64	-255.73	0.51	70.9	0.464E-01	0.54	511.45	0.79	0.24	.90663E+04
650.17	-255.73	0.51	97.0	0.339E-01	0.62	614.81	0.82	0.20	.15908E+05
926.70	-255.73	0.51	123.3	0.267E-01	0.67	725.82	0.85	0.18	.22750E+05
1203.24	-255.73	0.51	150.8	0.218E-01	0.70	840.58	0.87	0.16	.29592E+05
1479.77	-255.73	0.51	179.6	0.183E-01	0.74	957.57	0.88	0.15	.36434E+05
1756.30	-255.73	0.51	209.7	0.157E-01	0.76	1076.07	0.90	0.13	.43276E+05
2032.83	-255.73	0.51	241.0	0.137E-01	0.79	1195.71	0.91	0.12	.50118E+05
2309.37	-255.73	0.51	273.5	0.120E-01	0.82	1316.24	0.92	0.11	.56960E+05
2585.90	-255.73	0.51	307.1	0.107E-01	0.84	1437.50	0.93	0.09	.63802E+05

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard or CCC value of 0.100E-01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

2862.43	-255.73	0.51	341.7	0.963E-02	0.86	1559.39	0.94	0.08	.70644E+05
3138.96	-255.73	0.51	377.4	0.872E-02	0.88	1681.82	0.95	0.07	.77486E+05
3415.50	-255.73	0.51	414.1	0.795E-02	0.90	1804.73	0.96	0.06	.84328E+05
3692.03	-255.73	0.51	451.7	0.728E-02	0.92	1928.06	0.97	0.05	.91170E+05
3968.56	-255.73	0.51	490.2	0.671E-02	0.94	2051.77	0.98	0.04	.98012E+05
4245.10	-255.73	0.51	529.5	0.621E-02	0.96	2175.84	0.99	0.04	.10485E+06
4521.63	-255.73	0.51	569.7	0.578E-02	0.97	2300.21	1.00	0.03	.11170E+06
4798.16	-255.73	0.51	610.7	0.539E-02	0.99	2424.88	1.01	0.02	.11854E+06
5074.69	-255.73	0.51	652.4	0.504E-02	1.00	2549.81	1.02	0.01	.12538E+06
5351.23	-255.73	0.51	694.9	0.473E-02	1.02	2674.99	1.02	0.00	.13222E+06
5627.76	-255.73	0.51	738.1	0.446E-02	1.03	2800.40	1.03	0.00	.13906E+06
5904.29	-255.73	0.51	782.1	0.421E-02	1.05	2926.02	1.05	0.00	.14591E+06

Cumulative travel time = 145905.4375 sec (40.53 hrs)
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

Due to the attachment or proximity of the plume to the bottom, the bottom coordinate for the FAR-FIELD differs from the ambient depth, ZFB = 0 m.
In a subsequent analysis set "depth at discharge" equal to "ambient depth".

BEGIN MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

Vertical diffusivity (initial value) = 0.249E-07 m^2/s
Horizontal diffusivity (initial value) = 0.610E-02 m^2/s

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)
TT = Cumulative travel time

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
5904.29	-255.73	0.51	782.1	0.421E-02	1.05	2926.02	1.05	0.00	.14591E+06
7109.08	-255.73	0.51	782.9	0.420E-02	1.05	2926.02	1.05	0.00	.17571E+06
8313.86	-255.73	0.51	783.7	0.420E-02	1.05	2926.02	1.05	0.00	.20552E+06
9518.65	-255.73	0.51	784.5	0.419E-02	1.05	2926.02	1.05	0.00	.23533E+06
10723.43	-255.73	0.51	785.4	0.419E-02	1.05	2926.02	1.05	0.00	.26514E+06
11928.22	-255.73	0.51	786.2	0.418E-02	1.05	2926.02	1.05	0.00	.29495E+06
13133.00	-255.73	0.51	787.0	0.418E-02	1.06	2926.02	1.06	0.00	.32476E+06
14337.79	-255.73	0.51	787.8	0.418E-02	1.06	2926.02	1.06	0.00	.35457E+06
15542.57	-255.73	0.51	788.7	0.417E-02	1.06	2926.02	1.06	0.00	.38438E+06
16747.36	-255.73	0.51	789.5	0.417E-02	1.06	2926.02	1.06	0.00	.41418E+06
17952.14	-255.73	0.51	790.3	0.416E-02	1.06	2926.02	1.06	0.00	.44399E+06
19156.93	-255.73	0.51	791.1	0.416E-02	1.06	2926.02	1.06	0.00	.47380E+06
20361.71	-255.73	0.51	791.9	0.415E-02	1.06	2926.02	1.06	0.00	.50361E+06
21566.50	-255.73	0.51	792.8	0.415E-02	1.06	2926.02	1.06	0.00	.53342E+06
22771.28	-255.73	0.51	793.6	0.415E-02	1.06	2926.02	1.06	0.00	.56323E+06
23976.07	-255.73	0.51	794.4	0.414E-02	1.07	2926.02	1.07	0.00	.59304E+06
25180.85	-255.73	0.51	795.2	0.414E-02	1.07	2926.02	1.07	0.00	.62285E+06
26385.64	-255.73	0.51	796.0	0.413E-02	1.07	2926.02	1.07	0.00	.65265E+06
27590.42	-255.73	0.51	796.8	0.413E-02	1.07	2926.02	1.07	0.00	.68246E+06
28795.21	-255.73	0.51	797.6	0.412E-02	1.07	2926.02	1.07	0.00	.71227E+06
29999.99	-255.73	0.51	798.5	0.412E-02	1.07	2926.02	1.07	0.00	.74208E+06

Cumulative travel time = 742080.4375 sec (206.13 hrs)

Simulation limit based on maximum specified distance = 30000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

CORMIX2: Multiport Diffuser Discharges End of Prediction File

22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222


Image 2
Sandpoint
TP Plume
Downstream Ambient
Velocity (.012 m/s)
Dover

August Conditions, Low Phosphorus Cormix Session Report

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                       CORMIX MIXING ZONE EXPERT SYSTEM
                           CORMIX Version 8.0GTD
                        HYDRO2:Version-8.0.0.0  April,2012
SITE NAME/LABEL:                 Pend Oreille River - Sandpoint outfall
  DESIGN CASE:                   Sandpoint WWTP TP discharge to Pend Oreille River
  FILE NAME:                     C:\data\ALLTECH\WATER\401certs\sandpoint 2013\sandpoint run5.prd
  Using subsystem CORMIX2:      Multiport Diffuser Discharges
  Start of session:              02/01/2013--09:57:01
***************************************************************************
SUMMARY OF INPUT DATA:
---------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = bounded
  Width                          BS       = 2926.08 m
  Channel regularity             ICHREG = 1
  Ambient flowrate               QA       = 239.22 m^3/s
  Average depth                  HA       = 6.71 m
  Depth at discharge             HD       = 5.18 m
  Ambient velocity               UA       = 0.0122 m/s
  Darcy-Weisbach friction factor F        = 0.0167
    Calculated from Manning's n           = 0.02
  Wind velocity                  UW       = 4 m/s
  Stratification Type            STRCND = A
  Surface temperature                     = 24 degC
  Bottom temperature                      = 21 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                RHOAS  = 997.2973 kg/m^3
  Bottom density                 RHOAB  = 997.9934 kg/m^3
---------------------------------------------------------------------------
DISCHARGE PARAMETERS:            Submerged Multiport Diffuser Discharge
  Diffuser type                  DITYPE = unidirectional perpendicular
  Diffuser length                LD       = 49.99 m
  Nearest bank                            = right
  Diffuser endpoints             YB1      = 230.73 m;    YB2 = 280.72 m
  Number of openings             NOPEN  = 41
  Number of Risers               NRISER = 41
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.25 m
  Port/Nozzle diameter           D0       = 0.0762 m
    with contraction ratio                = 1
  Equivalent slot width          B0       = 0.0037 m
  Total area of openings         TA0      = 0.1870 m^2
  Discharge velocity             U0       = 0.85 m/s
  Total discharge flowrate       Q0       = 0.158602 m^3/s
  Discharge port height          H0       = 0.41 m
  Nozzle arrangement             BETYPE = unidirectional without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 0 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge temperature (freshwater)    = 21 degC
  Corresponding density          RHO0   = 997.9934 kg/m^3
  Density difference             DRHO   = -0.0545 kg/m^3
  Buoyant acceleration           GP0    = -0.0005 m/s^2
  Discharge concentration        C0     = 2.868 mg/l
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
---------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)        q0     = 0.003173 m^2/s
  Momentum flux                  m0     = 0.002691 m^3/s^2
  Buoyancy flux                  j0     = -0.000002 m^3/s^3
---------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 18.11 m         LM  = 18.85 m
  lm' = 1.27 m         Lb' = 0.33 m         La  = 0.34 m
  (These refer to the actual discharge/environment length scales.)
---------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number               FR0    = 599.54
  Port/nozzle Froude number      FRD0   = 132.83
  Velocity ratio                 R      = 69.57
---------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                       = no
  Water quality standard specified      = yes
  Water quality standard         CSTD   = 0.01 mg/l
  Regulatory mixing zone                = no
  Region of interest                    = 50000 m downstream
***************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS    = MS4 |
  *------------------------*
  This flow configuration applies to a layer corresponding to the linearly
  stratified density layer at the discharge site.
  Applicable layer depth = water depth = 5.18 m
***************************************************************************
```

```
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

--------------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
    255.73 m from the right bank/shore.
  Number of display steps NSTEP = 20 per module.
--------------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.1396 mg/l
  Dilution at edge of NFR              s = 20.5
  NFR Location:                        x = 107.08 m
    (centerline coordinates)           y = 0 m
                                       z = 0.38 m
  NFR plume dimensions:  half-width (bh) = 206.43 m
                          thickness (bv) = 0.65 m
Cumulative travel time:       8482.125 sec.
--------------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is greater than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is NEGATIVELY BUOYANT and will tend to sink towards
  the bottom.
IMPORTANT NOTE:
Since the effluent is NEGATIVELY BUOYANT, it is STRONGLY recommended that you consider using the Brine or Sediment options for
Effluent specification for a more detailed analysis.

CORMIX will however continue with the current simulation.
--------------------------------------------------------------------------------
Stratification assessment:
  The specified ambient density stratification is dynamically important.
  The discharge near field flow is trapped within the linearly stratified
  ambient density layer.
--------------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  101.44 m
  Intrusion stagnation point              =  -97.58 m
  Intrusion thickness                     =  0.81 m
  Intrusion half width at impingement     =  206.43 m
  Intrusion half thickness at impingement =  0.65 m

  In this case, the UPSTREAM INTRUSION IS VERY LARGE, exceeding ten (10)
    times the local water depth.
  This may be caused by the small ambient velocity, perhaps in combination
    with the strong buoyancy of the effluent, or alternatively, a strong
    ambient stratification.
  If the ambient conditions are quite unsteady (e.g. tidal), then the
    CORMIX steady-state predictions of the upstream intrusion are probably
    unrealistic.  The plume predictions in the immediate near-field, prior
    to the intrusion layer formation, are acceptable, however.
--------------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Plume becomes laterally fully mixed at 1903.43 m downstream.
--------------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in bounded section contacts nearest bank at 149.25 m downstream.
  Plume contacts second bank at 1903.43 m downstream.
********************** TOXIC DILUTION ZONE SUMMARY **********************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
No RMZ has been specified.
However:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                = 0.01  mg/l
  Corresponding dilution              s = 286.8
  Plume location:                     x = 1776.60 m
    (centerline coordinates)          y = -255.73 m
                                      z = 0.38 m
  Plume dimensions:      half-width (bh) = 2742.25 m
                          thickness (bv) = 1.36 m
********************** FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
--------------------------------------------------------------------------------
```

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX2: Multiport Diffuser Discharges
                          CORMIX Version 8.0GTD
                    HYDRO2 Version 8.0.0.0 April 2012
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Pend Oreille River - Sandpoint outfall
 Design case:       Sandpoint WWTP TP discharge to Pend Oreille River
 FILE NAME:         C:\...\WATER\401certs\sandpoint 2013\sandpoint run5.prd
 Time stamp:        Fri Feb  1 09:57:01 2013

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   2926.08  AS    =  19621.12  QA    =    239.22  ICHREG= 1
 HA    =      6.71  HD    =      5.18
 UA    =     0.012  F     =     0.017 USTAR =0.5562E-03
 UW    =     4.000 UWSTAR=0.4609E-02
 Density stratified environment
 STRCND=  A         RHOAM =  997.6454
 RHOAS =  997.2973  RHOAB =  997.9934  RHOAH0=  997.9390  E     =0.1320E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional_perpendicular
 BANK  =  RIGHT     DISTB =    255.73  YB1   =    230.73  YB2   =    280.72
 LD    =    49.99  NOPEN =   41       SPAC  =      1.25
 D0    =    0.076 A0    =     0.005 H0    =      0.41  SUB0  =      4.78
 D0INP =    0.076 CR0   =     1.000
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =    0.848 Q0    =     0.159       =0.1586E+00
 RHO0  =  997.9934  DRHO0 =-.5444E-01  GP0   =-.5350E-03
 C0    =0.2868E+01  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3173E-02  m0    =0.2691E-02  j0    =-.1698E-05  SIGNJ0=     -1.0
 Associated 2-d length scales (meters)
 lQ=B  =     0.004 lM    =     18.85  lm    =     18.11
 lmp   =      1.27 lbp   =      0.33  la    =      0.34

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1586E+00  M0    =0.1345E+00  J0    =-.8485E-04
 Associated 3-d length scales (meters)
 LQ    =      0.07  LM    =     24.11  Lm    =     30.08  Lb    =     46.84
                                       Lmp   =      3.18  Lbp   =      1.15

NON-DIMENSIONAL PARAMETERS
 FR0   =    599.54  FRD0  =    132.83  R     =     69.57  PL    =  140.00
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR RISER GROUPS:
 Properties of riser group with  1 ports/nozzles each:
 U0    =     0.848 D0    =     0.076 A0    =     0.005 THETA =      0.00
 FR0   =    599.54  FRD0  =    132.83  R     =     69.57
 (slot)             (riser group)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MS4    2
 2  Applicable layer depth HS =     5.18  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.2868E+01  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1000E-01
 REGMZ =  0
 XINT  =  50000.00  XMAX  =  50000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       255.73 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  20 display intervals per module
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y        Z        S        C        BV       BH       Uc        TT
     0.00     0.00     0.41      1.0 0.287E+01    0.04     0.04     0.836   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
------------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet-like motion in linear stratification with weak crossflow.
```

```
 Zone of flow establishment:              THETAE=      0.00  SIGMAE=      0.00
  LE    =       0.38  XE    =       0.38  YE    =       0.00  ZE    =       0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X         Y         Z         S         C         BV        BH        Uc        TT
 Individual jet/plumes before merging:
      0.38      0.00      0.41      1.0 0.287E+01    0.04      0.04      0.836   .00000E+00
      0.38      0.00      0.41      1.0 0.287E+01    0.04      0.04      0.836   .31834E-02
 Maximum jet height has been reached.
      0.55      0.00      0.41      1.3 0.227E+01    0.06      0.06      0.782   .18551E+00
      0.73      0.00      0.41      1.7 0.170E+01    0.08      0.08      0.586   .44387E+00
      0.90      0.00      0.41      2.1 0.136E+01    0.09      0.09      0.471   .76657E+00
      1.08      0.00      0.40      2.5 0.113E+01    0.11      0.11      0.392   .11669E+01
      1.25      0.00      0.40      3.0 0.967E+00    0.13      0.13      0.336   .16379E+01
      1.42      0.00      0.40      3.4 0.846E+00    0.15      0.15      0.294   .21667E+01
      1.60      0.00      0.40      3.8 0.750E+00    0.17      0.17      0.261   .27755E+01
      1.77      0.00      0.40      4.2 0.675E+00    0.18      0.18      0.236   .34378E+01
      1.95      0.00      0.40      4.7 0.612E+00    0.20      0.20      0.214   .41818E+01
      2.12      0.00      0.40      5.1 0.560E+00    0.22      0.22      0.196   .49931E+01
      2.30      0.00      0.40      5.6 0.516E+00    0.23      0.23      0.181   .58518E+01
      2.47      0.00      0.40      6.0 0.478E+00    0.25      0.25      0.168   .67945E+01
      2.64      0.00      0.40      6.4 0.446E+00    0.27      0.27      0.157   .77806E+01
      2.82      0.00      0.40      6.9 0.417E+00    0.28      0.28      0.147   .88524E+01
      3.00      0.00      0.39      7.3 0.392E+00    0.30      0.30      0.138   .99885E+01
      3.17      0.00      0.39      7.8 0.370E+00    0.32      0.32      0.131   .11162E+02
      3.34      0.00      0.39      8.2 0.349E+00    0.33      0.33      0.124   .12424E+02
      3.52      0.00      0.39      8.7 0.332E+00    0.35      0.35      0.118   .13720E+02
      3.69      0.00      0.38      9.1 0.315E+00    0.37      0.37      0.112   .15105E+02
      3.87      0.00      0.38      9.5 0.300E+00    0.38      0.38      0.107   .16521E+02
 Cumulative travel time =          16.5209 sec  (     0.00 hrs)
  Merging of individual jet/plumes not found in this module, but interaction
    will occur in following module.  Overall jet/plume interaction dimensions:
      3.87      0.00      0.38      9.5 0.300E+00    0.38     25.03      0.107   .16521E+02

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------
BEGIN MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING

 UPSTREAM INTRUSION PROPERTIES:
        Maximum elevation of jet/plume rise     =      3.08 m
        Layer thickness in impingement region   =      0.81 m
        Upstream intrusion length               =    101.44 m
        X-position of upstream stagnation point =    -97.58 m
        Thickness in intrusion region           =      0.81 m
        Half-width at downstream end            =    206.43 m
        Thickness at downstream end             =      0.65 m

 In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
   the local water depth.
 This may be caused by a very small ambient velocity, perhaps in
   combination with large discharge buoyancy.
 If the ambient conditions are strongly transient (e.g. tidal), then the
   CORMIX steady-state predictions of upstream intrusion are probably
   unrealistic.
 The plume predictions prior to boundary impingement and wedge formation
   will be acceptable, however.

  Control volume inflow:
       X         Y         Z         S         C         BV        BH        TT
     3.87      0.00      0.38      9.5 0.300E+00    0.38     25.03   .16521E+02

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)
   TT = Cumulative travel time

       X         Y         Z         S         C         BV        BH        ZU        ZL        TT
    -97.58      0.00      0.38 9999.9 0.000E+00    0.00      0.00      0.38      0.38   .84821E+04
    -93.48      0.00      0.38      37.9 0.756E-01    0.20     29.19      0.48      0.28   .16521E+02
    -73.43      0.00      0.38      15.8 0.182E+00    0.49     70.91      0.63      0.14   .16521E+02
    -53.37      0.00      0.38      12.0 0.239E+00    0.64     95.94      0.70      0.06   .16521E+02
    -33.31      0.00      0.38      10.4 0.275E+00    0.74    115.67      0.75      0.01   .16521E+02
    -13.26      0.00      0.38       9.7 0.295E+00    0.79    132.50      0.79      0.00   .16521E+02
      6.80      0.00      0.38       9.6 0.299E+00    0.80    188.96      0.80      0.00   .25698E+03
     26.85      0.00      0.38      11.5 0.249E+00    0.78    192.97      0.78      0.00   .19020E+04
     46.91      0.00      0.38      15.1 0.190E+00    0.73    196.66      0.74      0.02   .35470E+04
```

66.97	0.00	0.38	18.1	0.159E+00	0.68	200.11	0.72	0.04	.51921E+04
87.02	0.00	0.38	19.7	0.145E+00	0.66	203.35	0.71	0.05	.68371E+04
107.08	0.00	0.38	20.5	0.140E+00	0.65	206.43	0.71	0.06	.84821E+04

Cumulative travel time = 8482.1250 sec (2.36 hrs)

END OF MOD237: TERMINAL LAYER INJECTION/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = top-hat half-width, measured horizontally in y-direction
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic average (bulk) dilution
- C = average (bulk) concentration (includes reaction effects, if any)
- TT = Cumulative travel time

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
107.08	0.00	0.38	20.5	0.140E+00	0.65	206.43	0.71	0.06	.84821E+04
109.19	0.00	0.38	20.8	0.138E+00	0.65	208.87	0.71	0.06	.86549E+04
111.30	0.00	0.38	21.1	0.136E+00	0.65	211.32	0.71	0.06	.88278E+04
113.40	0.00	0.38	21.4	0.134E+00	0.65	213.77	0.71	0.06	.90006E+04
115.51	0.00	0.38	21.7	0.132E+00	0.65	216.22	0.71	0.06	.91734E+04
117.62	0.00	0.38	22.0	0.130E+00	0.65	218.68	0.71	0.05	.93462E+04
119.73	0.00	0.38	22.3	0.129E+00	0.66	221.13	0.71	0.05	.95190E+04
121.84	0.00	0.38	22.6	0.127E+00	0.66	223.59	0.71	0.05	.96918E+04
123.95	0.00	0.38	22.9	0.125E+00	0.66	226.05	0.71	0.05	.98646E+04
126.05	0.00	0.38	23.2	0.124E+00	0.66	228.51	0.71	0.05	.10037E+05
128.16	0.00	0.38	23.5	0.122E+00	0.66	230.97	0.71	0.05	.10210E+05
130.27	0.00	0.38	23.8	0.120E+00	0.66	233.43	0.71	0.05	.10383E+05
132.38	0.00	0.38	24.1	0.119E+00	0.66	235.90	0.71	0.05	.10556E+05
134.49	0.00	0.38	24.4	0.117E+00	0.67	238.37	0.71	0.05	.10729E+05
136.60	0.00	0.38	24.7	0.116E+00	0.67	240.84	0.72	0.05	.10902E+05
138.70	0.00	0.38	25.0	0.115E+00	0.67	243.31	0.72	0.05	.11074E+05
140.81	0.00	0.38	25.4	0.113E+00	0.67	245.78	0.72	0.05	.11247E+05
142.92	0.00	0.38	25.7	0.112E+00	0.67	248.26	0.72	0.05	.11420E+05
145.03	0.00	0.38	26.0	0.110E+00	0.67	250.74	0.72	0.04	.11593E+05
147.14	0.00	0.38	26.3	0.109E+00	0.68	253.22	0.72	0.04	.11766E+05
149.25	0.00	0.38	26.6	0.108E+00	0.68	255.70	0.72	0.04	.11938E+05

Cumulative travel time = 11938.3955 sec (3.32 hrs)

Plume is ATTACHED to RIGHT bank/shore.
Plume width is now determined from RIGHT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
149.25	-255.73	0.38	26.6	0.108E+00	0.68	511.45	0.72	0.04	.11938E+05
236.96	-255.73	0.38	37.6	0.763E-01	0.80	608.60	0.80	0.00	.19128E+05
324.66	-255.73	0.38	48.2	0.595E-01	0.88	716.42	0.88	0.00	.26317E+05
412.37	-255.73	0.38	59.2	0.484E-01	0.93	829.36	0.93	0.00	.33506E+05
500.08	-255.73	0.38	70.7	0.406E-01	0.97	945.29	0.97	0.00	.40695E+05
587.79	-255.73	0.38	82.7	0.347E-01	1.01	1063.22	1.01	0.00	.47885E+05
675.50	-255.73	0.38	95.2	0.301E-01	1.05	1182.62	1.05	0.00	.55074E+05
763.21	-255.73	0.38	108.1	0.265E-01	1.08	1303.18	1.08	0.00	.62263E+05
850.92	-255.73	0.38	121.5	0.236E-01	1.11	1424.70	1.11	0.00	.69452E+05
938.63	-255.73	0.38	135.4	0.212E-01	1.14	1547.02	1.14	0.00	.76641E+05
1026.34	-255.73	0.38	149.7	0.192E-01	1.17	1670.05	1.17	0.00	.83831E+05
1114.05	-255.73	0.38	164.4	0.174E-01	1.19	1793.69	1.19	0.00	.91020E+05
1201.76	-255.73	0.38	179.4	0.160E-01	1.22	1917.88	1.22	0.00	.98209E+05
1289.47	-255.73	0.38	194.9	0.147E-01	1.24	2042.56	1.24	0.00	.10540E+06
1377.18	-255.73	0.38	210.7	0.136E-01	1.26	2167.69	1.26	0.00	.11259E+06
1464.88	-255.73	0.38	226.8	0.126E-01	1.29	2293.23	1.29	0.00	.11978E+06
1552.59	-255.73	0.38	243.3	0.118E-01	1.31	2419.15	1.31	0.00	.12697E+06
1640.30	-255.73	0.38	260.1	0.110E-01	1.33	2545.41	1.33	0.00	.13416E+06
1728.01	-255.73	0.38	277.2	0.103E-01	1.35	2671.99	1.35	0.00	.14134E+06

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard or CCC value of 0.100E-01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

1815.72	-255.73	0.38	294.6	0.973E-02	1.37	2798.88	1.37	0.00	.14853E+06
1903.43	-255.73	0.38	312.3	0.918E-02	1.39	2926.03	1.39	0.00	.15572E+06

Cumulative travel time = 155722.9688 sec (43.26 hrs)
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

Due to the attachment or proximity of the plume to the bottom, the bottom coordinate for the FAR-FIELD differs from the ambient depth, ZFB = 0 m.
In a subsequent analysis set "depth at discharge" equal to "ambient depth".

BEGIN MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

Vertical diffusivity (initial value) = 0.834E-07 m^2/s
Horizontal diffusivity (initial value) = 0.598E-02 m^2/s

Profile definitions:
  BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
     = or equal to layer depth, if fully mixed
  BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
       measured horizontally in Y-direction
  ZU = upper plume boundary (Z-coordinate)
  ZL = lower plume boundary (Z-coordinate)
  S = hydrodynamic centerline dilution
  C = centerline concentration (includes reaction effects, if any)
  TT = Cumulative travel time

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
1903.43	-255.73	0.38	312.3	0.918E-02	1.39	2926.03	1.39	0.00	.15572E+06
4308.26	-255.73	0.38	316.5	0.906E-02	1.41	2926.03	1.41	0.00	.35284E+06
6713.09	-255.73	0.38	320.6	0.895E-02	1.43	2926.03	1.43	0.00	.54995E+06
9117.92	-255.73	0.38	324.6	0.883E-02	1.44	2926.03	1.44	0.00	.74707E+06
11522.74	-255.73	0.38	328.6	0.873E-02	1.46	2926.03	1.46	0.00	.94419E+06
13927.57	-255.73	0.38	332.6	0.862E-02	1.48	2926.03	1.48	0.00	.11413E+07
16332.40	-255.73	0.38	336.5	0.852E-02	1.50	2926.03	1.50	0.00	.13384E+07
18737.23	-255.73	0.38	340.4	0.843E-02	1.51	2926.03	1.51	0.00	.15355E+07
21142.06	-255.73	0.38	344.2	0.833E-02	1.53	2926.03	1.53	0.00	.17326E+07
23546.88	-255.73	0.38	348.0	0.824E-02	1.55	2926.03	1.55	0.00	.19298E+07
25951.71	-255.73	0.38	351.7	0.816E-02	1.56	2926.03	1.56	0.00	.21269E+07
28356.54	-255.73	0.38	355.4	0.807E-02	1.58	2926.03	1.58	0.00	.23240E+07
30761.37	-255.73	0.38	359.0	0.799E-02	1.60	2926.03	1.60	0.00	.25211E+07
33166.20	-255.73	0.38	362.7	0.791E-02	1.61	2926.03	1.61	0.00	.27182E+07
35571.03	-255.73	0.38	366.2	0.783E-02	1.63	2926.03	1.63	0.00	.29153E+07
37975.86	-255.73	0.38	369.8	0.776E-02	1.64	2926.03	1.64	0.00	.31125E+07
40380.68	-255.73	0.38	373.3	0.768E-02	1.66	2926.03	1.66	0.00	.33096E+07
42785.51	-255.73	0.38	376.8	0.761E-02	1.68	2926.03	1.68	0.00	.35067E+07
45190.34	-255.73	0.38	380.2	0.754E-02	1.69	2926.03	1.69	0.00	.37038E+07
47595.17	-255.73	0.38	383.7	0.748E-02	1.71	2926.03	1.71	0.00	.39009E+07
50000.00	-255.73	0.38	387.1	0.741E-02	1.72	2926.03	1.72	0.00	.40980E+07

Cumulative travel time = 4098038.0000 sec (1138.34 hrs)

Simulation limit based on maximum specified distance = 50000.00 m.
  This is the REGION OF INTEREST limitation.

END OF MOD262: PASSIVE AMBIENT MIXING IN STRATIFIED AMBIENT

CORMIX2: Multiport Diffuser Discharges End of Prediction File

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